

# Truck and Bus Regulation and Effect of the Economy on Emissions



Workshop  
December 3, 2009

California Environmental Protection Agency



Air Resources Board

## Today's Presentation

- Background
- Truck and Bus regulation summary
- Effect of the Economy on Emissions
- Recap and closing



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## Background

- Approved by Board December 12, 2008 with changes
- Board directed staff to provide an informational update December 2009
  - Impact of the economy on emissions
  - Other items
- Board meeting December 9 and 10, 2009

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## Diesel Particulate Matter Exposure

- Diesel vehicles largest source of diesel PM
- 70% of known cancer risk from all air toxics
- Risk is higher if closer to source
- Diesel Risk Reduction Plan adopted in 2000



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## Effects of Diesel Engine Emissions

- Each year in California, diesel PM contributes to more than 2,000 premature deaths and thousands of hospital admissions



**Good Lung**

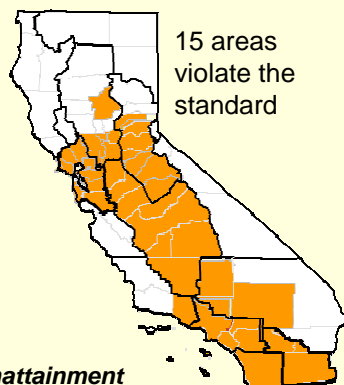


**Bad Lung**

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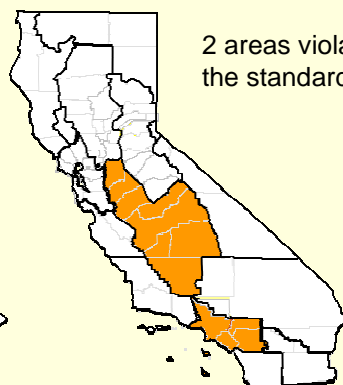
## Area Designations for National Ambient Air Quality Standards for Ozone and PM<sub>2.5</sub>

### ***8-Hour Ozone***



15 areas  
violate the  
standard

### ***PM<sub>2.5</sub> Annual***



2 areas violate  
the standard

■ **Nonattainment**  
□ **Unclassified/Attainment**

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## Regulation Structured to Meet State Implementation Plan (SIP)

- Regulation meets minimum NO<sub>x</sub> and PM<sub>2.5</sub> reductions to meet SIP targets for all years
  - South Coast (6 tpd NO<sub>x</sub> shortfall made up with PM)
  - San Joaquin Valley
- Critical for South Coast and San Joaquin Valley
  - PM and NO<sub>x</sub> reductions for PM<sub>2.5</sub> attainment in 2014
  - NO<sub>x</sub> reductions for ozone in 2017, 2020, and 2023
- No other measures can achieve same emissions reductions

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## Overall Benefits

- Provides major health benefits
  - About 9,400 fewer premature deaths
  - 150,000 fewer lower respiratory and asthma-related symptoms
  - 950,000 fewer lost work days
- Value estimated to range from \$48 to \$68 billion
- Reduces high cancer risk from diesel PM in all communities

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## Truck and Bus Regulation Requirements Summary



## Regulation Overview

- All vehicles must have particulate matter (PM) filters by 2014
  - Phased in starting 2011
- By 2023 all vehicles must have 2010 model year engines or equivalent
  - Phased in starting 2013
- Special provisions, credits
- Fleet calculator available to assist fleets



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## Option 1 – Best Available Control Technology Schedule No Reporting Required

- Engines less than 7 years old always ahead of schedule
- Replace with 2010 engine or one with a later compliance date on schedule
  - No action until 2021 with a 2007 MY engine

Engine Model Year	Requirement
Pre-1994	PM BACT by 2011 and replace by 2015
1994-1999	Replace by 2013
2000-2002	Replace by 2014
2003-2004	PM BACT by 2012 and replace by 2016
2005-2006	PM BACT by 2013 and replace by 2017
2007	Replace by 2021
2008	Replace by 2022
2009	Replace by 2023

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## Option 2 - BACT Percentage Limits Reporting Required

- By 2011 one out of four vehicles need to have a PM filter
- By 2013 one out of four needs to have a 2010 engine

January 1st	PM Filter	2010 Engine*
2011	25%	NA
2012	50%	NA
2013	75%	25%
2014	100%	50%
2015	"	50%
2016	"	60%
2017	"	80%
2018	"	80%
2019	"	80%
2020	"	90%
2021	"	90%
2022	"	90%
2023	"	100%

\*Emissions equivalent to 2010 MY engine

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## Option 3 – Fleet Averages Reporting Required

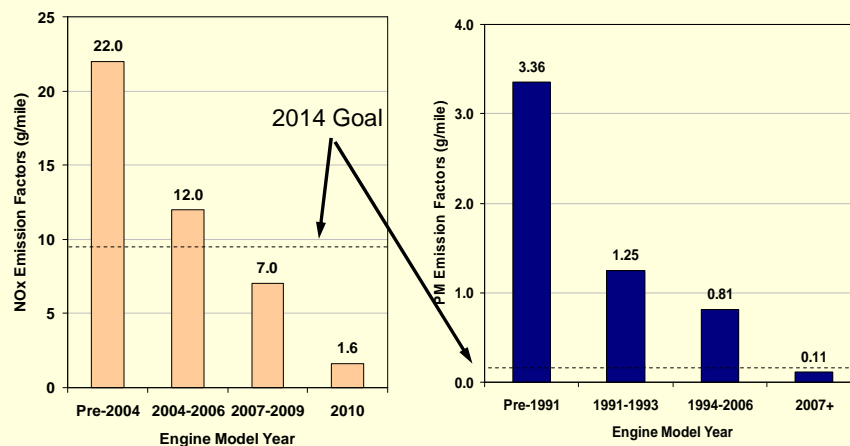
- Can be met by any method
- Allows widest variety of engine model years
- Allows widest variety of NOx control options
- Emissions factors specified in regulation
- Fleet emissions targets go down



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## Fleet Average Emission Factors By Engine Model Year

*Truck and Bus Regulation*



Note: For tractors and vehicles with a gross vehicle weight rating (GVWR) greater than 33,000 lbs. Separate emission factors for smaller vehicles.

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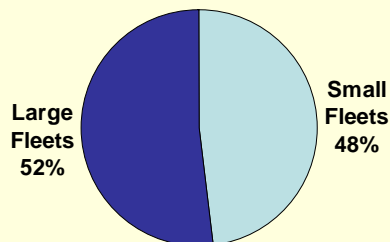
## Special Provisions Summary

- Small fleets
- Retirement credits
- Low use
- Usage below 7500 miles
- Attainment area operation
- Agricultural vehicles
- Early PM retrofit credits
- Unique vehicles
- PM retrofit safety
- Manufacturer delays
- Certain cab-over engine truck tractors
- Hybrid and alternative fueled vehicles credits
- Three day pass
- School buses
- Motor coaches
- Two engine sweepers

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## Small Fleets

- Three or fewer vehicles
- PM and NOx reductions begin 2014
  - One 2004 model year engine and PM filter until 2019
  - Remaining vehicles upgraded 2014-2016
- Cleanest engines by 2023

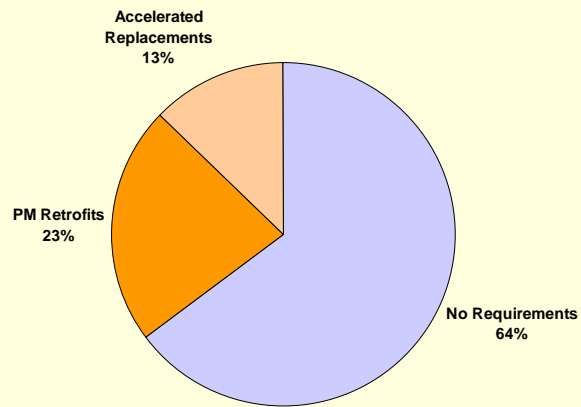


Number of vehicles registered in California (2006)

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## Accelerated Replacement Not Required for Every Truck



Number of Different Trucks Operating in California in 2008 = 941,000

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## Vehicle Retirement Credits

- Change added at board hearing in 2008
- Provides relief for fleets that have downsized compared to July 1, 2008
  - Same as if replacing with a 2010 model year engine
  - Delays NOx and PM requirements for other vehicles
- Expires prior to January 1, 2014
- Must report March 31, 2010
- Results in fewer PM and NOx reductions than original estimate

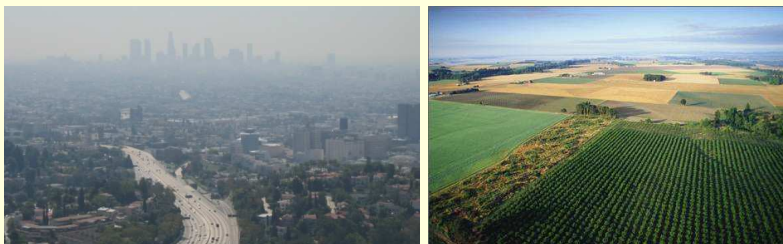
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## Existing Relief in Regulation

- Delays until 2014 for small fleets
- Delays until 2012 for large fleets
  - If no engines older than 17 years old
  - 25% of trucks have originally equipped PM filters
- Fleets that have downsized
  - Counts towards percentage requirements or fleet average
  - 25% retired delays PM and NOx by 1 year
- No costs for low use vehicles
  - Fewer than 1000 miles and 100 hours per year
- Delays for qualifying agricultural trucks

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## Impact of Economy on Emissions



## Approach

- Start with 2008 Rule emissions analysis published in staff report
- Effect of recession on emissions
  - Fewer miles traveled
  - Fewer new vehicles operating in California
- Estimate emissions in 2009 using available indicators for trucking activity and vehicle age
- Project emissions into the future

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## Historical Activity Data Sources Evaluated

Data Source	Region	Change 2007-2009	Latest Data Used
California Fuel Sales	Statewide	-13% to -18%	August 2009
California PeMS Counts	Statewide	-4% or more	October 2009
California WIM Counts	Statewide	-10% or more	March 2009
Port of LA / Long Beach Container Traffic	Los Angeles	-26%	October 2009
Port of Oakland Container Traffic	Bay Area	-17%	October 2009
ATA Tonnage Index	Nationwide	-10%	September 2009
BTS Transportation Services Index	Nationwide	-14%	September 2009

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## Effect of Recession on Trucking Today

- Overall truck activity in California is down between 10% and 18% since the 2007 peak
- National new truck sales are at their lowest levels in 25 years
- The CA registered truck population
  - Has not grown since 2007
  - Getting older because of fewer replacements
  - Fewer clean trucks than original projection

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## Vehicle Sales and Registration

- National truck sales are closely correlated with non-drayage truck registration in California.

	Percent Change Relative to 2005	
Year	National <sup>1</sup>	California <sup>2</sup>
2006	+12%	+6%
2007	-40%	-5%
2008	-46%	-47%
2009	-64%	-58%*

<sup>1</sup> WardsAuto national sales database

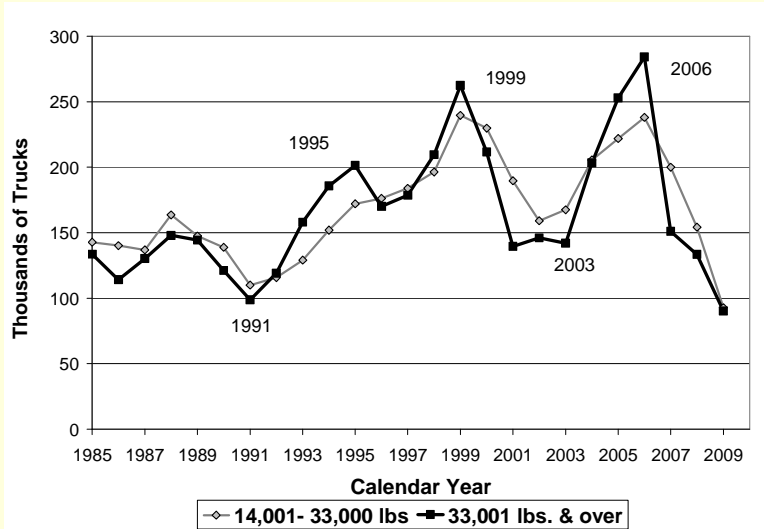
<sup>2</sup> Analysis of California DMV new truck registration data

\* Excludes drayage trucks purchased to comply with regulation

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## National Truck Sales

- Lowest level in 25 years
- High year to year variability and sensitivity to economic trends



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## DMV Registration

- Analysis of DMV registration database (non-drayage trucks)
- 2007 standard trucks are 70% cleaner for NOx and 85% cleaner for diesel PM than older vehicles
- In absence of requirements, businesses have reduced purchases of clean vehicles in California due to recession

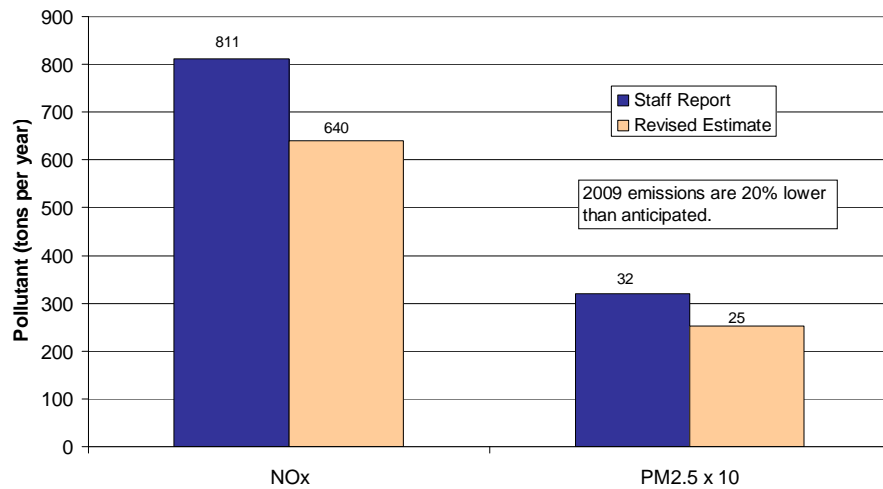
Year	Population (thousands) (non-drayage)	Average Age	Percent of New Vehicles in Fleet
2005	181	9.1	6.4%
2006	198	9.1	6.8%
2007	199	9.2	6.1%
2008	198	9.6	3.4%
2009	197	9.9	2.7%*

\* Approximately 3000 new drayage trucks were purchased in 2009 to comply with the Drayage Truck Rule. If included, the percentage increases to 3.8%

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## Revised 2009 Statewide Emissions Estimate

(2009 is prior to Rule phase-in requirements)



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## Projecting Emissions

- Two inventory inputs:
  - Activity growth projections
  - Vehicle sales projections
- Methodology
  - Evaluate economic and fuel consumption forecasts
  - Develop two bounding scenarios

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## Projecting Activity and Emissions

- California specific forecasts generally do not project more than a few years into the future
- Projections differ by source
- No forecasts project future truck activity and emissions in California
- Original estimate based on long term trend in vehicle activity based on regional travel models
- Update relies on existing economic forecast data to bound potential emissions projections

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## Available Economic Forecasts

- California Specific
  - California Department of Finance (to 2011)
  - California Legislative Analyst's Office (to 2015)
  - California Energy Commission (to 2030)
  - UCLA Anderson School (to 2011)
  - Beacon Economics (to 2013)
  - University of the Pacific (to 2014)
- Nationwide
  - Congressional Budget Office (to 2019)
  - Energy Information Agency (to 2030)

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## Truck Activity Growth Recovery

- Multiple economic forecasts were used to bound quick and slow growth scenarios
- Quick recovery growth scenario
  - California economy begins to recover in 2010
  - Economy returns to long-term trend in about 8 years
    - Two years after national economy returns to trend
- Slow growth scenario
  - California economy begins recovery in 2011
  - Growth rate after 2011 at historical average
  - Does not return to pre-recession trend in foreseeable future

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## New Truck Sales Recovery

- Recovery in forecasted sales were bounded to give two scenarios
- New sales sensitive to economic trends
- Quick growth scenario assumes:
  - Recovery begins in 2010
  - Sales rebound strongly 2010 and 2011 (36%/year)
  - 2012 and future sales increase (5%/year) through 2015
- Slow growth scenario assumes:
  - Recovery begins in 2012
  - Sales rebound (11%/year) through 2017 but do not return to pre-recession trend in foreseeable future

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## Analysis

- Projected vehicle activity and truck sales were used to project future truck emissions
- Estimated emissions were compared to emissions reductions resulting from the rule as adopted

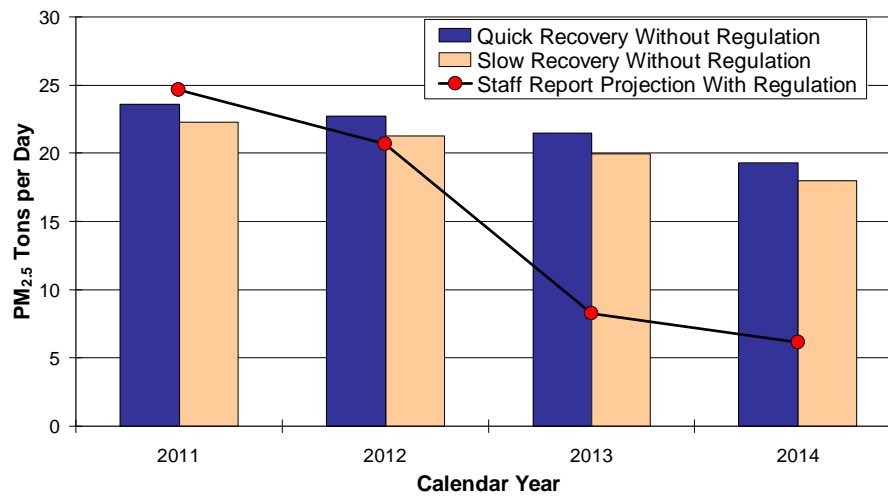
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## Projected Emissions Compared to Rule Reductions

- PM<sub>2.5</sub>
  - In 2011 the recession results in lower emissions than in the Rule (as published in the staff report)
  - After 2011, the Rule results in lower emissions than the recession
  - After 2012 the Rule results in much lower emissions than the recession
- NO<sub>x</sub>
  - Rule phase-in starts in 2013
  - The Rule results in lower emissions than the recession

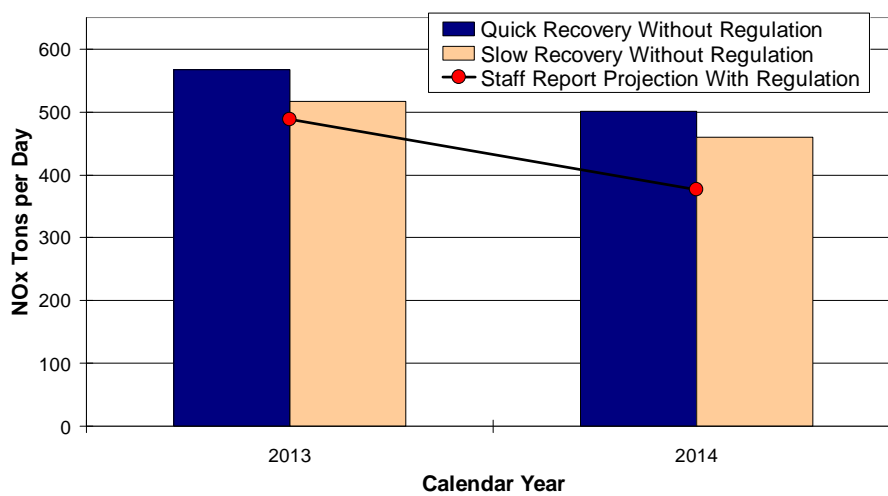
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## PM<sub>2.5</sub> Emissions Projection



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## NOx Emissions Projection



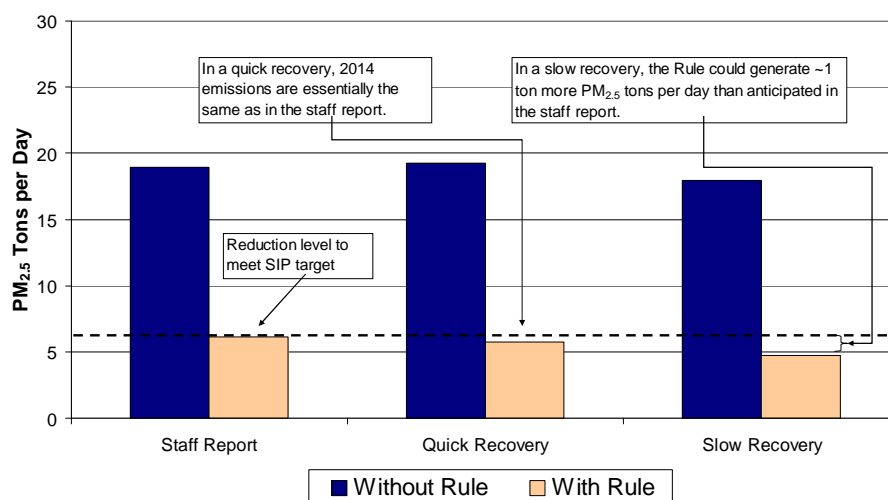
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## Emissions and 2014 SIP Targets

- The rule was designed to provide emissions reductions to meet SIP targets
- In either scenario, the Rule is still necessary to meet the 2014 target
- Depending on how the economy grows, emissions may or may not be below the 2014 target

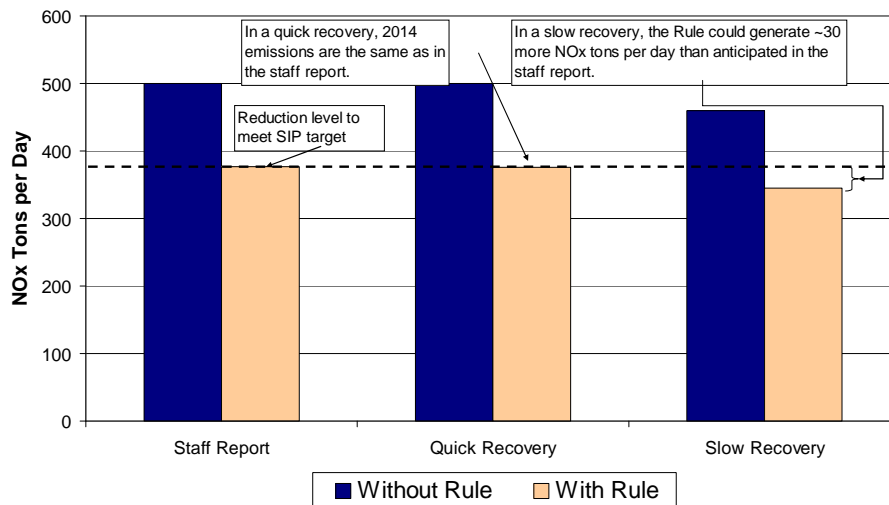
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## Projected 2014 PM<sub>2.5</sub> Emissions



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## Projected 2014 NO<sub>x</sub> Emissions



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## Consequences of Not Securing the Reductions Relied Upon in the Regulation

- Diminished public health benefits
- A need to make up shortfall with other regulations by 2014
- A possible disapproval of the SIP leading to:
  - Freezing of transportation funds
  - A federal implementation plan to address the shortfall
- Failure to attain the PM<sub>2.5</sub> standard resulting in new planning requirements

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## Conclusions

- The recession has resulted in reduced emissions today
- Projections suggest emissions in 2011 will be lower than the Rule was designed to achieve
- After 2012 the Rule will result in lower emissions than the recession alone
- The Rule is necessary to meet SIP targets in 2014 established to meet Federal air quality standards under the Clean Air Act and to protect public health